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Exploring PCK in High Emotional Intelligence College Students: Arts Integrated Learning

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Abstract

This study aims to explore Pedagogical Content Knowledge (PCK) in college students with high emotional intelligence in the context of art-integrated mathematics learning. PCK is an important component in teaching that combines material knowledge and pedagogical skills to deliver material effectively to students. In this study, college students with high emotional intelligence were selected as subjects to explore how emotional intelligence can support the development of their PCK, especially in learning that integrates art into mathematics learning. The results showed that high emotional intelligence allows college students to more effectively manage classes, understand students' needs, and deliver materials in a more creative and enjoyable way. In addition, the integration of art in mathematics learning provides opportunities for teacher to develop their pedagogical skills, such as the ability to create contextual and interactive learning situations. The conclusion of this study is that High Emottional Intelligence (HEI) greatly supports teachers' PCK which supports learning. This study provides insight into the importance of developing PCK supported by emotional intelligence in the context of innovative and integrative learning. Recommendations based on the results of this study are that further research is needed on the Influence of PCK and Emotional Intelligence Integration on Students' Academic Performance and the Role of Emotional Intelligence Training for Teachers in Improving Effective PCK Implementation.

Keywords: *High Emottional Intelligence, PCK, College Students.*

Introduction

Emotional intelligence has the potential to serve as an effective tool in providing psychological expertise (Ackley, 2016). Emotional intelligence impacts college students' psychological well-being (Costa et al., 2013). Emotional intelligence as a predictor of mental, social, and physical well-being in university students (Extremera & Fernandez-Berrocal, 2006). People with HEI are more likely to experience greater psychological well-being compared to those with low emotional intelligence (Carmeli et al., 2009). However, the level of emotional intelligence in students differs, making it an important and intriguing topic to explore.

The preliminary study results indicated that emotional intelligence levels among Elementary School Teacher Education college students at Nahdlatul Ulama University varied significantly, with some students classified as having high, medium, or low emotional intelligence. Emotional intelligence is a crucial factor in helping Elementary Teacher Education students grow into skilled future teachers. However, research on the application of HEI in education remains limited.

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The connection between emotional intelligence and education is becoming increasingly accepted by the public. It is widely believed that emotional intelligence is essential for effective learning and behavior, that it plays a key role in predicting success, and that it can be easily observed and assessed in students (Mayer & Cobb, 2000). Previous research has indicated that EI affects the learning outcomes, such as social, cognitive, personal growth, and satisfaction with the university experience, of students at Chinese research universities. Other research has also found that college students' emotional intelligence positively influences their learning motivation and self-efficacy (Chang & Tsai, 2022). Research also indicates that effective educators possess not only HEI but also strong Pedagogical Content Knowledge. The study examines how the pedagogical content knowledge and emotional intelligence of K-12 teachers influence their teaching self-efficacy (Rider, 2025). According to prior research, there is still a lack of in-depth analysis regarding the application of PCK and EI in the learning process.

PCK is a crucial foundation of knowledge that teachers need in order to teach effectively (Sutamrin et al., 2022). A teacher needs to possess a strong PCK to teach a subject effectively and ensure it is more comprehensible for students (Ekiz-Kiran et al., 2021). PCK involves not just a teacher's knowledge, but also the application of that knowledge into professional practice (Martins & Baptista, 2024). As a result, PCK is essential for teachers in the learning process. Mathematics is one of the subjects that requires PCK, as previous studies have shown that it demands a thorough conceptual understanding, which is enhanced by strong PCK (Sakaria et al., 2023).

Given this background, it is important to analyze PCK in college students with HEI in mathematics education (Jamil et al., 2024). Thus, this study seeks to explore PCK among college students with HEI in arts-based mathematics lessons. The research focuses on Elementary School Mathematics lessons based on the arts, specifically regarding flat shapes.

Literature Review

Emotional intelligence (EI) refers to the ability to recognize, understand, and manage one's own emotions, as well as those of others (Sitora Akbarovna, 2024). Teachers' emotional intelligence affects students' motivation in academic learning (Rahman et al., 2024). For teachers, HEI is indispensable, as it helps them to navigate the complex social dynamics of the classroom (Rezapoor & Mohammadzadeh, 2024). Teachers with strong emotional intelligence can build rapport with students, manage classroom behavior effectively, and create an inclusive learning environment (Yan et al., 2024). Moreover, emotionally intelligent teachers are better equipped to handle stress and maintain their well-being, which is essential for sustaining long-term success in the teaching profession. Teachers who are committed to developing and refining these skills will be better prepared to meet the challenges of the classroom and, ultimately, to make a lasting impact on their students' lives (Sitora Akbarovna, 2024). EI can influence how a teacher manages and applies Pedagogical Content Knowledge (PCK), because good emotional abilities help teachers to be more effective in understanding students' needs, managing the class, and delivering learning materials in a more interesting and easy-to-understand way.

PCK is widely recognized as a crucial component of teaching expertise. However, the extent to which teachers' own teaching practices can serve as a resource for developing their PCK has not been systematically investigated. In recent decades, PCK has become one of the most important subjects in educational research (Martins & Baptista, 2024). Teacher education is essential in fostering the development of pre-service teachers' PCK (Schiering et al., 2023). Teachers play a crucial role in both instructing students and influencing how they learn (Ekiz-Kiran et al., 2021).

Teaching a specific subject offers teachers numerous opportunities to enhance their subject-specific knowledge and skills, especially in mathematics (Li & Copur-Gencturk, 2024). Mathematics content demands a deep conceptual understanding, which is supported by strong PCK (Sakaria et al., 2023). Mastery of mathematics, as the primary objective of math education, along with other skills, is developed by teachers in schools through didactic and pedagogical activities. The quality of mathematics instruction in elementary schools is largely influenced by the teacher's understanding of PCK in mathematics teaching. Previous research on PCK in Mathematics Learning using the STEAM approach found that: (1) students' PCK was primarily in the moderate range, (2) the skills students had mastered well included creating and presenting contextual problems that connected mathematics and science, and (3) the skills students had yet to develop were guiding students in problem-solving, addressing student difficulties, and drawing conclusions (Maharani & Julie, 2025). The study also found that the teacher's PCK in applying RME (Realistic Mathematics Education) in geometry met ten out of the sixteen PCK indicators after receiving guidance. The use of RME in teaching and learning makes the process more meaningful, allowing students to connect mathematics with real-life situations. Implementing RME also enhances the teacher's PCK. Since elementary school teachers are responsible for teaching almost all subjects, it is expected that their PCK will be developed to a higher quality. Determining a teacher's PCK is challenging, so alternative measurement methods and long-term studies are required for more accurate results. Additionally, teachers must be aware of their PCK levels to encourage self-improvement (Zubaidah et al., 2023).

Methods

This study employed a qualitative approach to examine PCK in college students with HEI within the context of mathematics learning integrated with the arts. The participants consisted of students from the Elementary School Teacher Education program who demonstrated HEI, selected through a validated emotional intelligence test. The research instruments included an emotional intelligence test to assess the participants' emotional intelligence levels, semi-structured interviews to gain a deeper understanding of PCK implementation, classroom observations to examine the integration of arts in mathematics learning, and documentation analysis to evaluate the effectiveness of integrating arts and PCK. The study was carried out in three main phases: the preparation phase, which involved instrument preparation, testing participants' emotional intelligence, and training on PCK and arts integration; the implementation phase, where students designed and implemented mathematics lessons integrated with the arts; and the evaluation phase, which included interviews to explore students' reflections on their experiences. The Emotional Intelligence analysis in this study consists of 5 aspects which are explained in table 1. In the PCK indicator, coding is carried out for PCK analysis in mathematics learning integrated with art, which is intended to make it easier for researchers to carry out the process of analyzing research results in Table 2. The collected data were analyzed through thematic analysis to identify patterns related to PCK and emotional intelligence in the learning process. This study adhered to ethical research principles, including obtaining participant consent, ensuring confidentiality of personal information, and confirming voluntary participation.

Aspect Emotional Intelligence	**Ability Manage Connection**
	Empathy and Social Awareness
	Problem Solving and Emotional Regulation

	Self Motivation
	Self- awareness

Table 1 Aspects of Emotional Intelligence

PCK Components	**Sub components**	**Code**	**Indicator Integrator art in learning mathematics**
Knowledge Content	Knowledge Content	C1 C2 C3 C4 C5	Explain understanding of building area flat Explain method determine wide get up flat with give example. Explain how get formula get up flat Give example connection between draft area and concept art (music, dance, drama or visual art) Explain procedure in settlement problem related mathematics wide get up flat with context art.
Knowledge Pedagogy	Planning and organizing learning	P1 P2	Compiling lesson plans with complete components. Prepare a lesson plan that integrates learning mathematics material wide get up flat with art (music, dance, drama or visual art)
	Selection and Implementation of strategy/ approach learning	P3 P4	Choosing a strategy and approach learning for teach wide get up flat that can integrate with art (music, dance, drama or visual art). Implementing strategies/ approaches that accommodate diversity of participants educate participants educate can understand material Study
	Organizing materials and assignments Study	P5 P6 P7 P8 P9	Choose one type arts music, *visual art*, theater, and dance) which can customized with material mathematics that will taught Arrange / sort Contents for make it easier activity Study participant educate. Choose appropriate tasks with topic / material wide get up flat taught, goal teaching and strategies use. Choose example from various activity the right art For Objective motivate, clarify, or deepen material wide get up flat Choose problem existing contextual the relationship with arts (music, visual art, drama, dance) for participant educate
	Representation election	P10	Knowing and using representations, analogies, illustrations, explanations, examples and demonstrations that support material to be more easy understood participant educate.

PCK Components	Sub components	Code	Indicator Integrator art in learning mathematics
	Selection and implementation evaluation	P11	Choose method proper evaluation that is appropriate with strategy/ approach learning and the material taught
Knowledge of students	Characteristics participant educate	S1 S2	Know Miscellaneous characteristics participant educate Use characteristics participant educate as foothold in learning.
	Ability beginning related material mathematics that will taught	S3 S4	Identifying ability beginning participant educate related the material to be taught. Identifying knowledge prerequisite participant related education with the material taught.
	Difficulties, errors and misconceptions participant educate	S5 S6	Identifie difficulty participant educate in Study mathematics Know misconceptions that occur in participants educate related draft get up flat,

Table 2 PCK Analysis Code

Results and Discussion

The results of this study will be presented based on PCK indicators and also aspects of emotional intelligence.

Indicator	Description
C1	Define the area of a flat shape as the number of square units of area used to cover the entire surface of the flat shape.
C2	Gives an example of calculating the number of tiles to cover a floor.
C3	1. Proving the area formula using a visual approach and geometric transformation. 2. utilizing a small square grid to show the relationship between length, width, and area 3. explaining the transformation of a triangle into a rectangle through parallel lines and the division of a triangle 4. demonstrate an understanding of how area formulas are derived from basic concepts of geometry and multiplication as repeated addition.
C4	1. Music art: combining song lyrics with mathematical formulas 2. Dance art: using floor patterns and dance movements to form flat shapes such as squares 3. Drama art: linking roles in drama with fine art projects 4. Fine art / visual Art: Results of the resulting project such as tile collages, wall hangings.
C5	Procedure for solving 1. Understand the problem: identify the dimensions of the triangle, the area of the triangle, and the area of the canvas as targets to be covered.

	2. Make a plan: use a numerical strategy to calculate the number of triangles needed based on the total area 3. calculate the area accurately and determine the number of triangles based on the total area of the canvas 4. Recheck the results of the work

Table 3 Results of HEI Content Knowledge

Based on the explanation above (Table 3), understanding the concept of the area of a flat shape can be introduced through various approaches involving basic mathematical concepts and art integration. The use of visual approaches, such as proving the area formula through geometric transformations and using square grids, allows students to understand the relationship between length, width, and area. Integration of the arts, such as music, dance, drama, and fine arts, enriches mathematics learning in a creative way, connects mathematical concepts with artistic expression, and helps students see the relevance of mathematics in everyday life. In addition, systematic problem-solving procedures, which begin with understanding the problem, planning numerical strategies, accurate calculations, and re-checking the results of work, provide a clear and structured approach to solving mathematical problems. All of this contributes to the development of effective Pedagogical Content Knowledge (PCK) in mathematics learning integrated with the arts.

Aspects of Emotional Intelligence	**Description of Content Knowledge**
Relationship management ability	HEI connects abstract concepts such as the area of a plane figure with the arts (music, dance, drama, visual arts), which shows intellectual empathy for how others learn. This reflects an awareness of how others can understand concepts through creative approaches. HEI is able to create an interdisciplinary approach by connecting abstract mathematical concepts with the arts.
Empathy and Social Awareness	By using relevant examples (such as drama simulations or floor patterns in dance), HEI demonstrates the ability to understand the needs and learning styles of others. This reflects a high level of empathy in supporting the learning process. The subject uses art (music, dance, drama, visual arts) as a medium to help understand the concept of the area of flat shapes.
Problem Solving and Emotional Regulation	HEI demonstrates the ability to present systematic solutions to problems (e.g., calculating the amount of fabric needed to cover the area of a canvas). It demonstrates emotional self-control in dealing with complex tasks and creativity in finding solutions. In solving practical problems, such as calculating the amount of fabric needed to cover a canvas, HEI demonstrates the ability to present systematic solutions.
Self Motivation	HEI simplifies abstract concepts into practical and artistic contexts, making them easier for others to understand.
Self-awareness	HEI used a visual and symbolic approach to explain the concept of flat geometry formulas, which shows the ability to recognize the

	strengths and weaknesses of the way knowledge is delivered so that effective strategies can be developed. The subject has an awareness of the importance of an approach that suits the needs of the learner

Table 4 Results of the Relationship between HEI Content Knowledge and Emotional Intelligence

The results of Table 4 show that college students with HEI are able to connect abstract mathematical concepts, such as the area of flat shapes, with art through a creative approach that shows empathy for how others learn. HEI is also able to understand other people's learning styles and use art to support the learning process. In problem solving, HEI shows the ability to provide systematic solutions, regulate emotions, and simplify abstract concepts into practical and artistic contexts. In addition, HEI has the self-awareness to adjust teaching strategies according to student needs.

Sub Components	**Indicator**	**Description Knowledge Pedagogy**
Planning and organizing learning	P1	Compiling a complete teaching module includes general information (author identity, initial competencies, Pancasila student profile, target students, facilities and infrastructure, learning models used), core components include learning objectives, assessments, meaningful understanding, trigger questions, learning activities and attachments such as LKPD, Evaluation and PPT Teaching Media)
	P2	Integrating learning about the area of flat shapes with art, such as using collages in learning about the area of flat shapes and the song "Rasa Sayange" whose lyrics are adapted to the area of flat shapes (squares and rectangles).
Selection and Implementation of strategy/ approach learning	P3	Choosing a student active learning strategy using Discovery Learning and Problem-Based Learning (PBL) learning models
	P4	Implementing Learning by actively involving students using the PBL model. Collage Art is introduced in phase 2 of PBL, namely organizing students to learn which aims to improve student understanding and is continued to phase 3 while Music Art appears in phase 3 of PBL, namely guiding group investigations with the aim of helping students memorize formulas after which students are asked to present the results of their work and conclude.
Organizing materials and assignments Study	P5	Choosing 2 types of art, namely Visual art in the form of Collage is used to teach the concept of Area of flat buildings such as "counting the number of pieces of origami paper (square / rectangular shapes used to cover a certain area, namely white cardboard. And Music art: in the form of the song Rasa Sayange whose lyrics are changed to the area of squares and rectangles.

	P6	Organizing the content begins with the initial activity by providing a short story of life then continued with Phase 1 PBL, namely the orientation of students to the problem, the problem raised is how to calculate the floor area followed by questions and answers, in phase 2 students are grouped then distributed LKPD and pieces of origami paper and paper that functions as a base in the form of squares and rectangles continued with phase 3 guiding group investigations, students are asked to arrange pieces of origami paper (in the form of squares or rectangles) onto the base paper until it is all covered then asked to count the number of paper pieces that have been successfully attached. Continue singing the song rasa sayange to help students memorize the square and rectangle formulas continued with the presentation of the results and concluding in the closing activity reflection is carried out on the learning
	P7	Choosing a task to work in groups to make a collage, namely arranging and sticking pieces of origami paper on a plane (paper), then they are asked to calculate the results of the area of the flat shape collage that has been made with group members.
	P8	Providing examples of how to make a collage from square or rectangular pieces of origami paper.
	P9	The contextual problem chosen is calculating the floor area that has been covered with tiles.
Representation election	P10	Using the analogy of origami paper pieces as tiles and white backing paper as the floor.
Selection and implementation evaluation	P11	The evaluation used is diagnostic evaluation with trigger questions, formative assessment with practical assessment and summative by completing pre-test and post-test questions.

Table 5 Results of Pedagogical Knowledge in Designing and Implementing Learning of Area of Flat Shapes with HEI

Based on Table 5, it shows that in planning and organizing learning, teachers prepare complete learning modules that include various important components such as learning objectives, assessments, and learning media. Teachers integrate art in mathematics learning, such as combining collage art with the concept of flat shape area and the song "Rasa Sayange" to help students understand the concept. In selecting and implementing learning strategies, teachers use the Problem-Based Learning (PBL) model and Student Active Learning to actively engage students. Teaching materials are organized by including visual art and music to support students' understanding of the area of flat shapes. Students are given collaborative tasks to make collages with origami paper and calculate the area formed. Evaluation is carried out using diagnostic, formative, and summative assessments to measure student understanding. Overall, an approach that integrates art in mathematics learning can improve students' understanding through creative and contextual activities.

Aspects of Emotional Intelligence	Description of Student Knowledge
Relationship management ability	Elementary Teacher Education students with HEI demonstrated knowledge and skills in building and managing social relationships with students through active interaction-based learning strategies, such as Problem-Based Learning (PBL) and Student Active Learning. The use of collage art and songs in learning demonstrated their understanding of the importance of students' emotional engagement in the learning process.
Empathy and Social Awareness	Elementary school teacher education students who have high social awareness show empathy in understanding the characteristics and needs of students. They integrate art-based learning to facilitate understanding of concepts, such as the use of collages and songs that are tailored to the teaching materials. This approach reflects their awareness of the importance of adjusting teaching methods to the emotional and social needs of students.
Problem Solving and Emotional Regulation	The application of Problem-Based Learning (PBL) in the learning they designed showed that PGSD students with high EI have the ability to solve problems and regulate their emotions well.
Self Motivation	Elementary school teacher education students with high EI show enthusiasm in developing innovative and interesting learning, such as using the song "Rasa Sayange" to help students memorize the area formula for flat shapes.
Self-awareness	Self-awareness in the context of emotional intelligence means understanding personal strengths and weaknesses in teaching and adapting to the needs of students.

Table 6 Results of the Relationship between Pedagogical Knowledge and Emotional Intelligence of PGSD Students with HEI

The results in Table 6 show that college students with high EI are able to build social relationships with students through active learning strategies such as PBL and Student Active Learning. The use of collage art and songs shows their understanding of the importance of students' emotional involvement. They also adjust their learning approaches to students' emotional and social needs. These students can manage problems and emotions well, and show self-motivation in developing innovative learning, such as using the song "Rasa Sayange" to help students memorize area formulas. Their self-awareness helps them adjust their teaching approaches to students' needs.

Sub components	Indicator	Description
Characteristics of students	S1	Knowledge of student characteristics, including social, emotional, motor, spiritual and life values aspects
	S2	Understand the characteristics of students as a basis for designing appropriate learning methods and

		implementing them in the practice of learning the area of flat shapes
Initial abilities related to the mathematics material to be taught	S3	Knowing the importance of knowing students' initial abilities, teachers will easily adjust the teaching methods or methods that will be given to students.
	S4	Strategy to find out prerequisite abilities using the question and answer method, providing written tests (pretests) related to the material to be taught.
Difficulties, errors and misconceptions of students	S5	Learning Difficulty Indicators: 1. Lack of focus of students and behavior that disrupts the learning atmosphere, 2. Inability of students to listen to the teacher properly, 3. Student scores that are below the average KKM, 4. Slowness of students in completing assignments
	S6	1. Strategy to identify misconceptions with an individual approach (face to face) 2. Strategy to overcome students' misconceptions related to the concept of the area of flat shapes in the form of a. re-explanation of the material b. Providing concept maps

Table 7 Results of HEI Student Knowledge

Table 7 shows that understanding student characteristics is very important in designing appropriate learning methods, especially in teaching the material of flat shape area. Knowing students' initial abilities allows teachers to adjust teaching strategies more effectively, such as using pretests or question and answer methods. Identification of student difficulties and errors, such as lack of focus or misunderstanding of the concept of flat shape area, can be done with an individual approach and providing re-explanations or concept maps to overcome misconceptions. This approach helps create more effective learning that is in accordance with students' needs.

Aspects of Emotional Intelligence	**Description of Student Knowledge**
Relationship management ability	HEI's understanding of student characteristics, such as character, manners, and learning styles, reflects the ability to build positive relationships.
Empathy and Social Awareness	HEI's demonstrate empathy by understanding student difficulties, such as lack of focus and disruptive behavior, as indicators of difficulty understanding the material.
Problem Solving and Emotional Regulation	In dealing with student misconceptions, HEI used an individual approach and concept maps.

Self Motivation	HEI's efforts to understand the characteristics of students demonstrate high self-motivation.
Self-awareness	HEI's ability to distinguish between prior skills and prerequisite knowledge reflects good self-awareness.

Table 8 The Relationship Between Student Knowledge and Emotional Intelligence

The results of Table 8 show that college students with HEI have the ability to understand student characteristics, such as behavior, ethics, and learning styles, which allows them to build positive relationships. They also show high empathy and social awareness by understanding student difficulties, such as lack of focus and disruptive behavior, as indications of difficulty in understanding the material. In dealing with student misconceptions, HEI uses an individual approach and concept maps to help students. In addition, HEI shows high self-motivation by trying to understand student characteristics, and has good self-awareness by being able to distinguish between skills that have been mastered and prerequisite knowledge that needs to be understood.

The results of this study indicate that college students with HEI support PCK abilities that can support learning. This is supported by previous studies tha Successful teachers have strong PCK and emotional intelligence (Rider, 2025). The results obtained in this study are likely due to the aspects in Emotional Intelligence being very comprehensive, including relationship management ability, empathy and social awareness, problem solving and emotional regulation, self-motivation, and self-awareness, so that they can strengthen PCK to support learning.

Relationship management skills refer to the skills in building and managing positive relationships with students. In the context of PCK, this skill is very important because it can create a supportive learning environment, where teachers can create a positive and inclusive classroom atmosphere, so that students feel comfortable to interact, ask questions, and collaborate. This makes it easier to teach and understand the material (content knowledge) (Gul et al., 2021). In addition, with good relationship management skills, teachers can adjust their teaching approach according to students' learning needs more personally, so that teaching methods become more effective (Langdon Warren, 2021). This skill also allows teachers to manage classroom dynamics, resolve conflicts between students, and create a sense of mutual respect that is very supportive in the learning process (Gul et al., 2021).

Empathy and social awareness are very important in PCK because both help teachers to identify and understand students' needs and feelings. Teachers who have empathy can feel the difficulties or obstacles that students may experience in understanding the material, so they can adjust the way they deliver the material to better suit their needs (Rehan Dar, 2016). Teachers with social awareness can also understand the social context of students, such as cultural differences, socio-economic backgrounds, and personal challenges that may affect their learning, allowing teachers to adapt teaching materials and teaching methods to be more relevant and inclusive. With empathy and social awareness, teachers can facilitate better interactions between students and create an atmosphere that supports collaboration, which in turn supports deeper understanding of the material (Rehan Dar, 2016; Swan & Riley, 2015).

Problem solving and emotional regulation are very important skills in dealing with challenges that arise in the learning process. In PCK, these skills support teachers in overcoming difficulties faced by students in understanding certain concepts. Teachers with problem solving skills can find alternative ways to explain the material, such as using more relevant examples or

appropriate visual aids. In addition, emotional regulation is also very important to help teachers regulate their emotions, especially in challenging situations, such as when the class is noisy or when dealing with students who are less enthusiastic (Stephanou & Oikonomou, 2018). Teachers who can regulate their emotions well will be more effective in delivering material and creating a positive learning atmosphere. This ability also allows teachers to respond more positively to students' emotional reactions, for example when they feel frustrated or anxious, thus creating a more supportive learning climate (Caballero et al., 2011).

Self-motivation is a very important internal drive in PCK, because this motivation helps teachers to continue learning and developing. Teachers who are personally motivated will continue to deepen their knowledge of the material and look for new ways to teach the material more effectively (Azizah et al., 2024). They will be open to changes in pedagogical approaches and continue to learn about innovations in education. Self-motivation is also important in dealing with teaching challenges, such as students who are not interested or material that is difficult to understand (Mbanugo et al., 2024). This motivation helps teachers to stay motivated in finding solutions so that the learning process continues to run well. In addition, teachers who demonstrate high motivation in teaching and learning can inspire students to become more motivated in their own learning, creating a positive atmosphere in the classroom (Antonopoulou, 2014; Azizah et al., 2024; Nurnindyah et al., 2023).

Self-awareness is the ability to recognize one's own strengths and weaknesses, which is also very important in PCK (Galiakberova et al., 2020). Teachers who have good self-awareness will continually reflect on their teaching practice and look for ways to improve themselves (Antonopoulou, 2014). They will know which approaches or methods are effective and which ones need to be improved to improve student understanding. Self-awareness also allows teachers to identify areas in their teaching that need improvement, such as the use of technology in learning, so that they can seek training or try new methods that are more effective (Ryan & Ryan, 2025). With good self-awareness, teachers can also recognize how their behavior and attitudes affect students, allowing them to adapt and improve the way they interact with students, thereby creating a more effective learning environment (Saodi et al., 2024).

Overall, relationship management ability, empathy and social awareness, problem solving and emotional regulation, self-motivation, and self-awareness strongly support teachers' Pedagogical Content Knowledge (PCK) in teaching. These skills enable teachers to manage the classroom well, adapt the subject matter to the needs of students, overcome challenges that arise, and continue to develop their abilities as educators. With effective integration of content knowledge and strong pedagogical skills, teachers can create deep and meaningful learning experiences for students.

Conclusion

The conclusion of this study is that in Content Knowledge it shows that the concept of area of flat shapes can be taught by combining mathematics and art, such as music, dance, and fine arts, to facilitate understanding of the relationship between length, width, and area. Visual approaches such as geometric transformations and grids of boxes clarify the concept. College students with HEI are able to creatively connect mathematics with art, understand students' learning styles, and simplify concepts into practical contexts and adjust teaching strategies to students' needs. Pedagogical knowledge shows that students with HEI can build social relationships through active learning strategies such as PBL and Student Active Learning. They use collage art and songs to engage students emotionally and adapt their teaching to students' emotional and social

needs. These students manage problems and emotions well, demonstrate self-motivation, and create innovative learning methods, such as using the song "Rasa Sayange" to help students memorize area formulas. Their self-awareness helps them adapt their teaching approaches to students' needs. Student Knowledge, understanding student characteristics is essential to designing effective learning, especially in teaching plane geometry. Knowing students' abilities helps teachers adjust strategies, such as pre-tests or Q&A methods. Identifying difficulties, such as lack of focus or misunderstandings, can be addressed with individual approaches and tools such as concept maps. HEI students are able to understand behaviors and learning styles, thus fostering positive relationships. They demonstrate empathy, address misunderstandings, and demonstrate high levels of self-motivation and self-awareness in adapting teaching strategies.

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Author Contribution

Sri Hartatik, Dwi Junaiti, and Raden Sulaiman contributed to the conception, data collections, data processing, and writing and review.

Conflict of Interest

There is no conflict of interest in the article. All author responsible for the content of the article.

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